

STANFORD UNIVERSITY

MEDICAL CENTER
PALO ALTO, CALIFORNIA

DEPARTMENT OF GENETICS
School of Medicine

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Dear Pitt:

George has been urging me to react to your letter of February 28. It is hard to think of anything new to add, but I will try to pull together and update past recommendations.

Reynolds visited not very long ago and I could not help but get a reasonably good impression of the kind of program he is laying out. His classification of subject areas seems to be a very reasonable one.

At some point the resources are going to give out and NASA should focus on the highest priority requirements in biology as well as other areas of space science. We should consider that the NIH and NSF already do a pretty good job in supporting basic science and NASA ought not to go out of its way to compete with them, which of course does not mean at all that it should avoid overlapping their interests in the right areas. NASA certainly has special requirements for information in the kinds of subject area that you and Chris Lambertsen are monitoring. Apart from some of these specialized topics, NASA can play a very special part in plugging a very serious gap in the national fabric of technology and science. On the one hand, the Department of Defense supports an immense volume of research and development in technological areas while it could do a great deal more than it does now to serve the general economic requirements of the country as well as its explicit defense mission. This is certainly not a general area that NASA needs to support any more vigorously than necessary to furnish its own particular technical requirements, say in propulsion. But between the applied technology that DOD specializes in and the pure science that NSF and the NIH take responsibility for, there is an intermediate zone, particularly in the development of instrumentation which is now still very inadequately funded. Requirements for biomedical instrumentation are only part of this picture; it does not take much imagination to realize the immense contribution that could be made to industrial as well as biomedical technology by the improvement of such instruments as the electron microscope, the extension of the light microscope to further frequency domains, and other ultra ultra microanalytical instrumentation. But these are fields for which the defense needs are not yet sufficiently apparent (though I believe they are

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very real) and with which our scientific colleagues are either insufficiently familiar or too haughtily unsympathetic to provide adequate encouragement within the framework of NIH-NSF. NASA could take an outstandingly productive part in assimilating the expressed needs of scientific progress for instrumentation development in specific areas and formulating these for implementation in several ways. The management of such scientific-engineering development programs should be a good match to its basic organization, traditions, personnel competence and overall objectives. The implementation could be carried out in two ways: a) by the establishment of one, two or three national laboratories for the instrumentation development work, and b) of course by subcontracting to industry. It is essential that NASA acquire an adequate and fully functional academic consultative organization to help guide its further operation in these directions. But some government agency like NASA is absolutely essential to mediate between these research needs and the capacity of American industrial and engineering talent to meet them.

In some respects this proposal should be regarded as my constructive counter to the suggestion of the establishment of national laboratories for exobiology research. I believe that basic scientific work is best conducted according to its present pattern in an integral relationship with the training function of the universities. And as a matter of realistic practice this does indeed impose some limits on the proper extent of development of a given field at any one university. I believe that it would discourage the desirable interest in the basic aspects of exobiology research to have too much of it concentrated in any one "national laboratory", but the situation is far different on the technological instrumentation side. The engineering effort here is best done at a level of intensity beyond the capability of a typical academic organization, and is absolutely vital for the practical implementation of the research ideas that our biochemical and biological colleagues are likely to develop for space investigation. I would, for example, be quite enthusiastic about the development of such an ultra analytical instrumentation laboratory, say, within the framework of the applied physics group at Stanford University. And I would hope that there would be a few comparable developments at strategically located university centers elsewhere in the United States. In the course of our exobiology program we have identified any number of exciting potential prospects for instrument development whose total realization would be far beyond the capability of any group of a size that could be accommodated within the framework of the medical school. In any case the direction of such a laboratory should be in the hands of an experienced applied physicist or engineer with whom a scientist like myself could very well interact at a scientific and technical level without being overwhelmed by the administrative problems that it would generate. I trust you will understand that I give an example in personal terms to illustrate the idea in a more substantial way.

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Insofar as such a laboratory should be closely connected with an academic community to identify the realistic needs and applications of the instruments, and many of these would have ramifications that include but go far beyond the space science per se, the laboratories I am suggesting here definitely should not be identical with those established for specific mission requirements such as JPL and Ames.

We need merely point to the acute shortage of people trained in such fields as optics to illustrate the urgency of developing such laboratories as training as well as research centers for instrumentation work.

Yours sincerely,

Joshua Lederberg
Professor of Genetics

cc: G.A. Derbyshire